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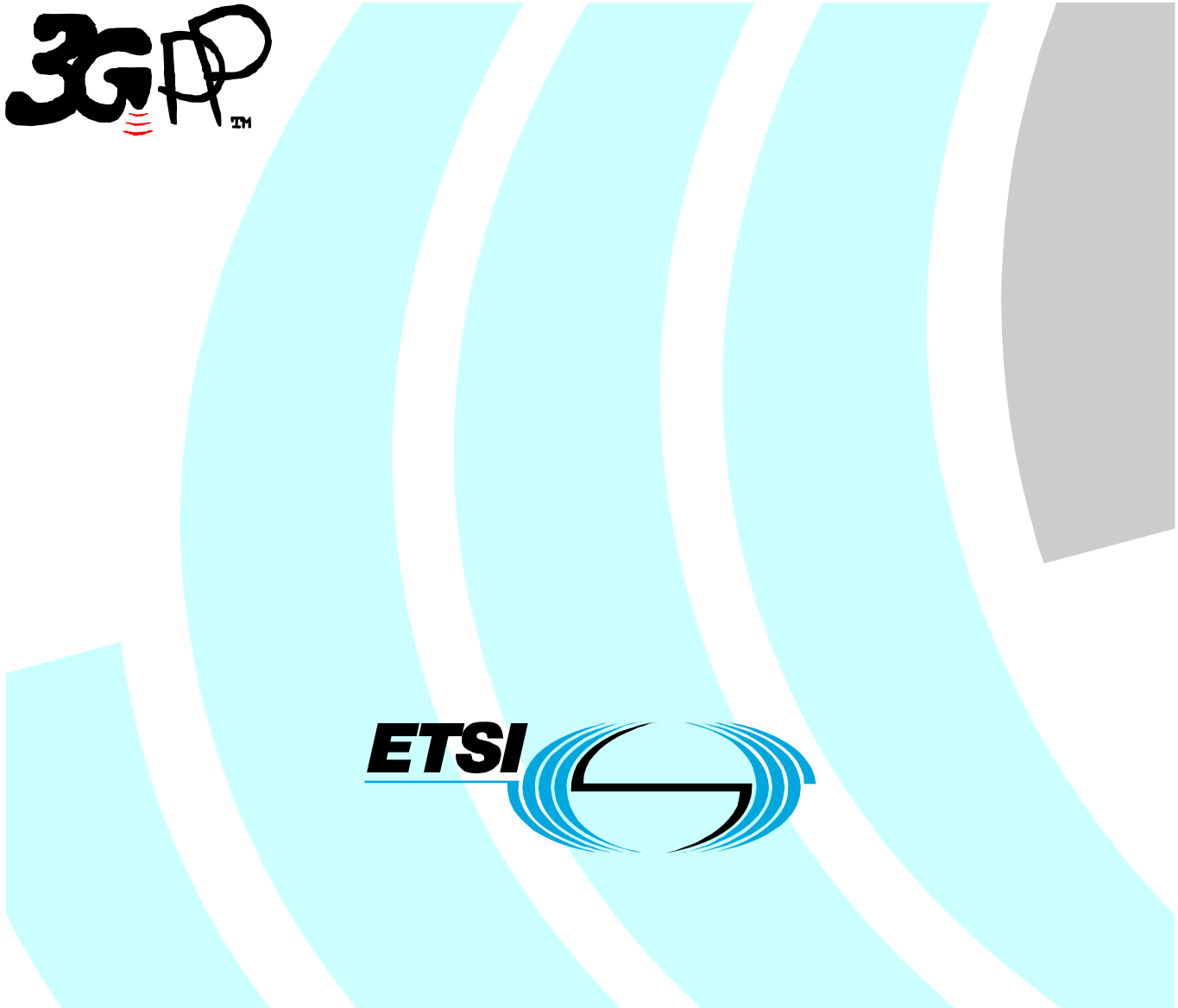
Technical Specification

Universal Mobile Telecommunications System (UMTS);
UTRA repeater radio transmission and reception
(3GPP TS 25.106 version 8.2.0 Release 8)



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Contents

Foreword

This Technical Specification has been produced by the 3rd Generation Partnership Project (3GPP).

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1 Scope

The present document establishes the minimum radio frequency performance of UTRA FDD repeaters.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
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- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] ITU-R Recommendation SM.329: "Unwanted emissions in the spurious domain".

[2] 3GPP TS 25.143: "UTRA Repeater Conformance Testing".

[3] 3GPP TS 25.113: "Base Station and Repeater Electromagnetic Compatibility".

[4] ETSI ETR 273-1-2: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Improvement of radiated methods of measurement (using test sites) and evaluation of the corresponding measurement uncertainties; Part 1: Uncertainties in the measurement of mobile radio equipment characteristics; Sub-part 2: Examples and annexes".

[5] 3GPP TR 25.942: "RF System Scenarios".

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply:

Donor coupling loss: is the coupling loss between the repeater and the donor base station.

Down-link: Signal path where base station transmits and mobile receives.

Pass band: The repeater can have one or several pass bands. The pass band is the frequency range that the repeater operates in with operational configuration. This frequency range can correspond to one or several consecutive nominal 5 MHz channels. If they are not consecutive each subset of channels shall be considered as an individual pass band.

Repeater: A device that receives, amplifies and transmits the radiated or conducted RF carrier both in the down-link direction (from the base station to the mobile area) and in the up-link direction (from the mobile to the base station)

Up-link: Signal path where mobile transmits and base station receives.

3.2 Symbols

(void)

3.3 Abbreviations

For the purposes of the present document, the following abbreviations apply:

EVM	Error Vector Magnitude
FDD	Frequency Division Duplex
FFS	For Further Study
IMT2000	International Mobile Telecommunication-2000
ITU	International Telecommunication Union
RF	Radio Frequency
UARFCN	UTRA Absolute Radio Frequency Channel Number
UMTS	Universal Mobile Telecommunication System
UTRA	Universal Terrestrial Radio Access
WCDMA	Wide band Code Division Multiple Access

4 General

This specification applies only to UTRA-FDD repeaters.

Unless otherwise stated, all requirements in this specification apply to both the up-link and down-link directions.

4.1 Relationship between Minimum Requirements and Test Requirements

The Minimum Requirements given in this specification make no allowance for measurement uncertainty. The repeater test specification 25.143 section 5 [2] defines Test Tolerances. These Test Tolerances are individually calculated for each test. The Test Tolerances are used to relax the Minimum Requirements in this specification to create Test Requirements.

The measurement results returned by the Test System are compared - without any modification - against the Test Requirements as defined by the shared risk principle.

The Shared Risk principle is defined in ETR 273 Part 1 sub-part 2 section 6.5 [4].

4.2 Regional requirements

Some requirements in TS 25.106 may only apply in certain regions. Table 4.1 lists all requirements that may be applied differently in different regions.

Table 4.1: List of regional requirements.

Clause number	Requirement	Comments
5.1	Frequency bands	Some bands may be applied regionally.
5.2	Up-link to down-link frequency separation	The requirement is applied according to which frequency bands in Clause 5.1 that are supported by the Repeater.
5.3	Channel arrangement	The requirement is applied according to what frequency bands in clause 5.1 that are supported by the Repeater.
6.1	Maximum output power	In certain regions, the minimum requirement for normal conditions may apply also for some conditions outside the ranges of conditions defined as normal.
9.1.1	Spectrum emission mask	The mask specified may be mandatory in certain regions. In other regions this mask may not be applied.
9.2.1.1	Spurious emissions (Category A)	These requirements shall be met in cases where Category A limits for spurious emissions, as defined in ITU-R Recommendation SM.329 [1], are applied.
9.2.1.2	Spurious emissions (Category B)	These requirements shall be met in cases where Category B limits for spurious emissions, as defined in ITU-R Recommendation SM.329 [1], are applied.
9.2.2	Protection of the BS receiver in the operating band	This requirement may be applied for the protection of UTRA FDD BS receivers in geographic areas in which both UTRA FDD BS and UTRA FDD Repeaters are deployed.
9.2.3	Co-existence with other systems in the same geographical area	These requirements may apply in geographic areas in which both UTRA FDD Repeater and GSM900 DCS1800, PCS1900, GSM850 and/or UTRA FDD operating in another frequency band are deployed.
9.2.4	Co-existence with co-located and co-sited base stations	These requirements may be applied for the protection of other BS receivers when GSM900 DCS1800, PCS1900, GSM850 and/or FDD BS operating in another frequency band are co-located with a UTRA FDD Repeater.
9.2.5	Spurious emissions: Co-existence with PHS	This requirement may be applied for the protection of PHS in geographic areas in which both PHS and UTRA FDD Repeaters are deployed.
9.2.6.1	Spurious emissions: Co-existence with UTRA TDD-Operation in the same geographic area	This requirement may be applied for the protection of UTRA UE in geographic areas in which both UTRA TDD BS and UTRA FDD Repeaters are deployed.
9.2.6.2	Spurious emissions: Co-existence with UTRA TDD - Co-location	This requirement may be applied for the protection of UTRA TDD BS receivers when UTRA TDD BS and UTRA FDD Repeaters are co-located.
9.2.7	Co-.existence with services in adjacent frequency bands	This requirement may be applied for the protection in bands adjacent to the downlink band as defined in clause 5.1 in geographic areas in which both an adjacent band service and UTRA FDD Repeater are deployed.
9.2.8	Protection of public safety operations	This requirement may be applied for the protection of public safety systems in geographic areas in which both UTRA FDD Repeater and public safety systems are deployed.
11.2	Input Intermodulation: Co-location with other systems	The requirement may be applied when GSM900, DCS1800, PCS1900, GSM850 and/or UTRA FDD BS operating in another frequency band and UTRA-FDD Repeaters are co-located.
11.3	Input Intermodulation: Co-existence with other systems	These requirements may apply in geographic areas in which both UTRA FDD Repeater and GSM900, DCS1800, PCS1900, GSM850 and/or UTRA FDD operating in another frequency band are deployed.

5 Frequency bands and channel arrangement

5.1 Frequency bands

a) A UTRA/FDD Repeater is designed to operate in one or several pass bands within either of the following paired frequency bands;

Table 5.1: Frequency bands

Operating Band	UL Frequencies UE transmit, Node B receive	DL frequencies UE receive, Node B transmit
I	1920 - 1980 MHz	2110 -2170 MHz
II	1850 -1910 MHz	1930 -1990 MHz
III	1710 - 1785 MHz	1805 - 1880 MHz
IV	1710 - 1755 MHz	2110 - 2155 MHz
V	824 - 849MHz	869 - 894MHz
VI	830 - 840 MHz	875 - 885 MHz
VII	2500 - 2570 MHz	2620 - 2690 MHz
VIII	880 - 915 MHz	925 - 960 MHz
IX	1749.9 - 1784.9 MHz	1844.9 - 1879.9 MHz
X	1710 - 1770 MHz	2110 - 2170 MHz
XI	1427.9 - 1452.9 MHz	1475.9 - 1500.9 MHz
XII	698 - 716 MHz	728 - 746 MHz
XIII	777 - 787 MHz	746 - 756 MHz
XIV	788 - 798 MHz	758 - 768 MHz

b) Deployment in other frequency bands is not precluded.

5.2 TX - RX frequency separation

a) A UTRA/FDD repeaters is designed to operate with the following TX to RX frequency separation

Table 5.2: TX-RX frequency separation

Operating Band	TX-RX frequency separation
I	190 MHz
II	80 MHz.
III	95 MHz
IV	400 MHz
V	45 MHz
VI	45 MHz
VII	120 MHz
VIII	45 MHz
IX	95 MHz
X	400 MHz
XI	48 MHz
XII	30 MHz
XIII	31 MHz
XIV	30 MHz

b) A UTRA/FDD repeater can support both fixed and variable up-link to down-link frequency separation.

c) The use of other up-link to down-link frequency separations in existing or other frequency bands shall not be precluded.

5.3 Channel arrangement

5.3.1 Channel spacing

The nominal channel spacing is 5 MHz, but this can be adjusted to optimise performance in a particular deployment scenario.

5.3.2 Channel raster

The channel raster is 200 kHz for all bands, which means that the centre frequency must be an integer multiple of 200 kHz. In addition, a number of additional centre frequencies are specified according to the table 5.3, which means that and the centre frequencies for these channels are shifted 100 kHz relative to the general raster.

5.3.3 Channel number

The carrier frequency is designated by the UTRA Absolute Radio Frequency Channel Number (UARFCN).

For each operating band, the UARFCN values are defined as follows.

Uplink: $N_U = 5 * (F_{UL} - F_{UL\_Offset})$, for the carrier frequency range $F_{UL\_low} \le F_{UL} \le F_{UL\_high}$

Downlink: $N_D = 5 * (F_{DL} - F_{DL\_Offset})$, for the carrier frequency range $F_{DL\_low} \le F_{DL} \le F_{DL\_high}$

For each operating Band, F_{UL_Offset}, F_{UL_low}, F_{UL_high}, F_{DL_Offset},, F_{DL_low} and F_{DL_high} are defined in Table 5.3 for the general UARFCN. For the additional UARFCN, F_{UL_Offset}, F_{DL_Offset} and the specific F_{UL} and F_{DL} are defined in Table 5.4.

Table 5.3: UARFCN definition (general)

Band	UPLINK (UL) UE transmit, Node B receive			DOWNLINK (DL) UE receive, Node B transmit		
	UARFCN formula offset F_{UL_Offset} [MHz]	Carrier frequency (F_{UL}) range [MHz]		UARFCN formula offset F_{DL_Offset} [MHz]	Carrier frequency (F_{DL}) range [MHz]	
		F_{UL_low}	F_{UL_high}		F_{DL_low}	F_{DL_high}
I	0	1922.4	1977.6	0	2112.4	2167.6
II	0	1852.4	1907.6	0	1932.4	1987.6
III	1525	1712.4	1782.6	1575	1807.4	1877.6
IV	1450	1712.4	1752.6	1805	2112.4	2152.6
V	0	826.4	846.6	0	871.4	891.6
VI	0	832.4	837.6	0	877.4	882.6
VII	2100	2502.4	2567.6	2175	2622.4	2687.6
VIII	340	882.4	912.6	340	927.4	957.6
IX	0	1752.4	1782.4	0	1847.4	1877.4
X	1135	1712.4	1767.6	1490	2112.4	2167.6
XI	733	1430.4	1450.4	736	1478.4	1498.4
XII	-22	700.4	713.6	-37	730.4	743.6
XIII	21	779.4	784.6	-55	748.4	753.6
XIV	12	790.4	795.6	-63	760.4	765.6

Table 5.4: UARFCN definition (additional channels)

Band	UPLINK (UL) UE transmit, Node B receive		DOWNLINK (DL) UE receive, Node B transmit	
	UARFCN formula offset F_{UL_Offset} [MHz]	Carrier frequency [MHz] (F_{UL})	UARFCN formula offset F_{DL_Offset} [MHz]	Carrier frequency [MHz] (F_{DL})
I	-	-	-	-
II	1850.1	1852.5, 1857.5, 1862.5, 1867.5, 1872.5, 1877.5, 1882.5, 1887.5, 1892.5, 1897.5, 1902.5, 1907.5	1850.1	1932.5, 1937.5, 1942.5, 1947.5, 1952.5, 1957.5, 1962.5, 1967.5, 1972.5, 1977.5, 1982.5, 1987.5
III	-	-	-	-
IV	1380.1	1712.5, 1717.5, 1722.5, 1727.5, 1732.5, 1737.5 1742.5, 1747.5, 1752.5	1735.1	2112.5, 2117.5, 2122.5, 2127.5, 2132.5, 2137.5, 2142.5, 2147.5, 2152.5
V	670.1	826.5, 827.5, 831.5, 832.5, 837.5, 842.5	670.1	871.5, 872.5, 876.5, 877.5, 882.5, 887.5
VI	670.1	832.5, 837.5	670.1	877.5, 882.5
VII	2030.1	2502.5, 2507.5, 2512.5, 2517.5, 2522.5, 2527.5, 2532.5, 2537.5, 2542.5, 2547.5, 2552.5, 2557.5, 2562.5, 2567.5	2105.1	2622.5, 2627.5, 2632.5, 2637.5, 2642.5, 2647.5, 2652.5, 2657.5, 2662.5, 2667.5, 2672.5, 2677.5, 2682.5, 2687.5
VIII	-	-	-	-
IX	-	-	-	-
X	1075.1	1712.5, 1717.5, 1722.5, 1727.5, 1732.5, 1737.5, 1742.5, 1747.5, 1752.5, 1757.5, 1762.5, 1767.5	1430.1	2112.5, 2117.5, 2122.5, 2127.5, 2132.5, 2137.5, 2142.5, 2147.5, 2152.5, 2157.5, 2162.5, 2167.5
XI	-	-	-	-
XII	-39.9	700.5, 701.5, 706.5, 707.5, 712.5, 713.5	-54.9	730.5, 731.5, 736.5, 737.5, 742.5, 743.5
XIII	11.1	779.5, 784.5	-64.9	748.5, 753.5
XIV	2.1	790.5, 795.5	-72.9	760.5, 765.5

6 Output power

Output power, Pout, of the repeater is the mean power of one carrier at maximum repeater gain delivered to a load with resistance equal to the nominal load impedance of the transmitter.

Rated output power, PRAT, of the repeater is the mean power level per carrier at maximum repeater gain that the manufacturer has declared to be available at the antenna connector.

6.1 Maximum output power

Maximum output power, Pmax, of the repeater is the mean power level per carrier measured at the antenna connector in specified reference condition.

6.1.1 Minimum Requirements

The requirements shall apply at maximum gain, with WCDMA signals in the pass band of the repeater, at levels that produce the maximum rated output power per channel.

When the power of all signals is increased by 10 dB, compared to the power level that produce the maximum rated output power, the requirements shall still be met.

In normal conditions, the Repeater maximum output power shall remain within limits specified in Table 6.1 relative to the manufacturer's rated output power.

Table 6.1: Repeater output power; normal conditions

Rated output power	Limit
P ≥ 43 dBm	+2 dB and -2 dB
39 ≤ P < 43 dBm	+2 dB and -2 dB
31 ≤ P < 39 dBm	+2 dB and -2 dB
P < 31 dBm	+3 dB and -3 dB

In extreme conditions, the Repeater maximum output power shall remain within the limits specified in Table 6.2 relative to the manufacturer's rated output power.

Table 6.2: Repeater output power; extreme conditions

Rated output power	Limit
P ≥ 43 dBm	+2,5 dB and -2,5 dB
39 ≤ P < 43 dBm	+2,5 dB and -2,5 dB
31 ≤ P < 39 dBm	+2,5 dB and -2,5 dB
P < 31 dBm	+4 dB and -4 dB

In certain regions, the minimum requirement for normal conditions may apply also for some conditions outside the ranges of conditions defined as normal.

7 Frequency stability

Frequency stability is the ability to maintain the same frequency on the output signal with respect to the input signal.

7.1 Minimum requirement

The frequency deviation of the output signal with respect to the input signal shall be no more than ±0,01 ppm.

8 Out of band gain

Out of band gain refers to the gain of the repeater outside the pass band.

8.1 Minimum requirement

The intended use of a repeater in a system is to amplify the in band signals and not to amplify the out of band emission of the donor base station.
In the intended application of the repeater, the out of band gain is less than the donor coupling loss.
The repeater minimum donor coupling loss shall be declared by the manufacturer. This is this the minimum required attenuation between the donor BS and the repeater for proper repeater operation.

The gain outside the pass band shall not exceed the maximum level specified in table 8.1, where:

- f_offset is the distance from the centre frequency of the first or last 5 MHz channel within the pass band.

Table 8.1: Out of band gain limits 1

Frequency offset from the carrier frequency, f_offset	Maximum gain
2,7 ≤ f_offset < 3,5 MHz	60 dB
3,5 ≤ f_offset < 7,5 MHz	45 dB
7,5 ≤ f_offset < 12,5 MHz	45 dB
12,5 MHz ≤ f_offset	35 dB

For 12,5 MHz ≤ f_offset the out of band gain shall not exceed the maximum gain of table 8.2 or the maximum gain stated in table 8.1 whichever is lower.

Table 8.2: Out of band gain limits 2

Repeater maximum output power as in 9.1.1.1	Maximum gain
P < 31 dBm	Out of band gain ≤ minimum donor coupling loss
31 dBm ≤ P < 43 dBm	Out of band gain ≤ minimum donor coupling loss
P ≥ 43 dBm	Out of band gain ≤ minimum donor coupling loss - (P-43dBm)
NOTE 1: The out of band gain is considered with 12,5 MHz ≤ f_offset	

9 Unwanted emission

Unwanted emissions consist of out-of-band emissions and spurious emissions [1]. Out of band emissions are unwanted emissions immediately outside the pass band bandwidth resulting from the modulation process and non-linearity in the transmitter, but excluding spurious emissions. Spurious emissions are emissions which are caused by unwanted transmitter effects such as harmonics emission, parasitic emission, intermodulation products and frequency conversion products, but exclude out of band emissions.

The out-of-band emissions requirement for repeater is specified both in terms operating band unwanted emissions and protection of the BS receiver in the operating band. The Operating band unwanted emissions define all unwanted emissions in the repeater operating band plus the frequency ranges 10 MHz above and 10 MHz below that band. Unwanted emissions outside of this frequency range are limited by a spurious emissions requirement.

9.1 Out of band emission

9.1.1 Void

9.1.2 Operating band unwanted emissions

Operating band unwanted emissions comprise an emission mask applied outside the repeater passband and a general requirement applied outside the mask but inside the frequency range of the operating band unwanted emissions.

The general operating band unwanted emissions limits are given in table 9.0

Table 9.0: General operating band unwanted emissions requirements

Frequency range of operating band	Category A	Category B	Measurement bandwidth	Notes
≤ 1 GHz	-13 dBm	-16 dBm	100 kHz	1,2
≥ 1 GHz	-13 dBm	-15 dBm	1 MHz	2,3

NOTE 1: Bandwidth as in ITU-R Recommendation SM.329 [1], s4.1

NOTE 2: Limit based on ITU-R Recommendation SM.329 [1], s4.3 and Annex 7

NOTE 3: Bandwidth as in ITU-R Recommendation SM.329 [1], s4.1. Upper frequency as in ITU-R SM.329 [1], s2.5 table 1

The mask defined in tables 9.1 to 9.4 below may be mandatory in certain regions. In other regions this mask may not be applied.

For regions where this clause applies, the requirement shall be met by a repeater's RF-signal output at maximum gain with WCDMA signals in the pass band of the repeater, at levels that produce the maximum rated output power per channel. The requirements shall also apply at maximum gain without WCDMA signals in the pass band.

Emissions shall not exceed the maximum level specified in tables 9.1 to 9.4 for the appropriate repeater maximum output power, in the frequency range from Δf = 2,5 MHz to Δf_{max} from the 5 MHz channel, where:

- Δf is the separation between the centre frequency of first or last 5 MHz channel used in the pass band and the nominal -3 dB point of the measuring filter closest to the carrier frequency.

- f_offset is the separation between the centre frequency of first or last 5 MHz channel in the pass band and the centre of the measuring filter.

- f_offset_{max} is 12,5 MHz.

- Δf_{max} is equal to f_offset_{max} minus half of the bandwidth of the measurement filter.

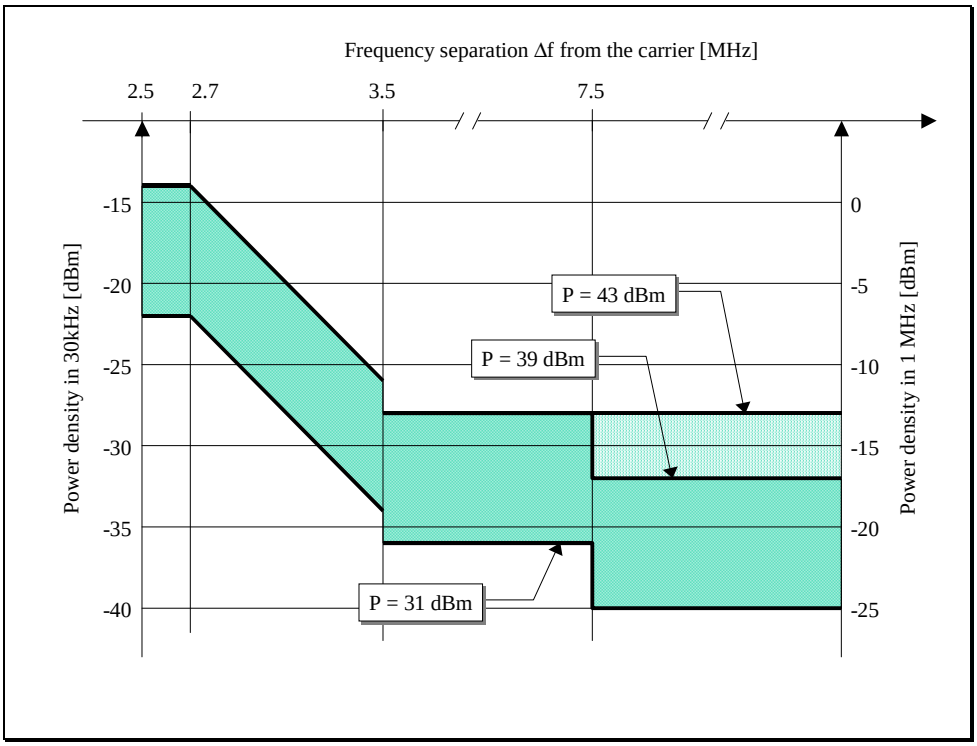

Figure 9.1: Illustrative diagram of emission mask

Table 9.1: Emission mask values, maximum output power P ≥ 43 dBm

Frequency offset of measurement filter -3dB point, Δf	Frequency offset of measurement filter centre frequency, f_offset	Minimum requirement	Measurement bandwidth (Note 2)
2,5 MHz ≤ Δf < 2,7 MHz	2,515MHz ≤ f_offset < 2,715MHz	-14 dBm	30 kHz
2,7 MHz ≤ Δf < 3,5 MHz	2,715MHz ≤ f_offset < 3,515MHz	$-14\text{dBm} - 15 \cdot \left(\frac{\text{f\_offset}}{\text{MHz}} - 2{,}715 \right) \text{dB}$	30 kHz
(Note 1)	3,515MHz ≤ f_offset < 4,0MHz	-26 dBm	30 kHz
3,5 MHz ≤ Δf ≤ f_{max}	4,0MHz ≤ f_offset < f_offset_{max}	-13 dBm	1 MHz

Table 9.2: Emission mask values, maximum output power 39 ≤ P < 43 dBm

Frequency offset of measurement filter -3dB point, Δf	Frequency offset of measurement filter centre frequency, f_offset	Minimum requirement	Measurement bandwidth (Note 2)
2,5 MHz ≤ Δf < 2,7 MHz	2,515MHz ≤ f_offset < 2,715MHz	-14 dBm	30 kHz
2,7 MHz ≤ Δf < 3,5 MHz	2,715MHz ≤ f_offset < 3,515MHz	$-14\text{dBm} - 15 \cdot \left(\frac{\text{f\_offset}}{\text{MHz}} - 2{,}715 \right)\text{dB}$	30 kHz
(Note 1)	3,515MHz ≤ f_offset < 4,0MHz	-26 dBm	30 kHz
3,5 MHz ≤ Δf < 7,5 MHz	4,0MHz ≤ f_offset < 8,0MHz	-13 dBm	1 MHz
7,5 MHz ≤ Δf ≤ f_{max}	8,0MHz ≤ f_offset < f_offset_{max}	P - 56 dB	1 MHz

Table 9.3: Emission mask values, maximum output power 31 ≤ P < 39 dBm

Frequency offset of measurement filter -3dB point, Δf	Frequency offset of measurement filter centre frequency, f_offset	Minimum requirement	Measurement bandwidth (Note 2)
2,5 MHz ≤ Δf < 2,7 MHz	2,515MHz ≤ f_offset < 2,715MHz	P - 53 dB	30 kHz
2,7 MHz ≤ Δf < 3,5 MHz	2,715MHz ≤ f_offset < 3,515MHz	$\text{P} - 53\text{dB} - 15 \cdot \left(\frac{\text{f\_offset}}{\text{MHz}} - 2{,}715 \right)\text{dB}$	30 kHz
(Note 1)	3,515MHz ≤ f_offset < 4,0MHz	P-65 dB	30 kHz
3,5 MHz ≤ Δf < 7,5 MHz	4,0MHz ≤ f_offset < 8,0MHz	P - 52 dB	1 MHz
7,5 MHz ≤ Δf ≤ f_{max}	8,0MHz ≤ f_offset < f_offset_{max}	P - 56 dB	1 MHz

Table 9.4: Emission mask values, maximum output power P < 31 dBm

Frequency offset of measurement filter -3dB point, Δf	Frequency offset of measurement filter centre frequency, f_offset	Minimum requirement	Measurement bandwidth (Note 2)
2,5 MHz ≤ Δf < 2,7 MHz	2,515MHz ≤ f_offset < 2,715MHz	-22 dBm	30 kHz
2,7 MHz ≤ Δf < 3,5 MHz	2,715MHz ≤ f_offset < 3,515MHz	$-22\text{dBm} - 15 \cdot \left(\frac{\text{f\_offset}}{\text{MHz}} - 2{,}715 \right)\text{dB}$	30 kHz
(Note 1)	3,515MHz ≤ f_offset < 4,0MHz	-34 dBm	30 kHz
3,5 MHz ≤ Δf < 7,5 MHz	4,0MHz ≤ f_offset < 8,0MHz	-21 dBm	1 MHz
7,5 MHz ≤ Δf ≤ f_{max}	8,0MHz ≤ f_offset < f_offset_{max}	-25 dBm	1 MHz

For operation in band II, IV, V, X, XII, XIII and XIV, the applicable additional requirement in Tables 9.4A, 9.4B or 9.4C apply in addition to the minimum requirements in Tables 9.1 to 9.4.

Table 9.4A: Additional emission mask values for Bands II, IV, X

Frequency offset of measurement filter -3dB point, Δf	Frequency offset of measurement filter centre frequency, f_offset	Additional requirement	Measurement bandwidth (Note 2)
2.5 MHz ≤ Δf < 3.5 MHz	2.515MHz ≤ f_offset < 3.515MHz	-15 dBm	30 kHz
3.5 MHz ≤ Δf ≤ Δf_{max}	4.0MHz ≤ f_offset < f_offset_{max}	-13 dBm	1 MHz

Table 9.4B: Additional emission mask values for Band V

Frequency offset of measurement filter -3dB point, Δf	Frequency offset of measurement filter centre frequency, f_offset	Additional requirement	Measurement bandwidth (Note 2)
2.5 MHz ≤ Δf < 3.5 MHz	2.515MHz ≤ f_offset < 3.515MHz	-15 dBm	30 kHz
3.5 MHz ≤ Δf ≤ Δf_{max}	3.55MHz ≤ f_offset < f_offset_{max}	-13 dBm	100 kHz

Table 9.4C: Additional emission mask values for Bands XII, XIII, XIV

Frequency offset of measurement filter -3dB point, Δf	Frequency offset of measurement filter centre frequency, f_offset	Additional requirement	Measurement bandwidth (Note 2)
2.5 MHz ≤ Δf < 3.5 MHz	2.515MHz ≤ f_offset < 3.515MHz	-13 dBm	30 kHz
3.5 MHz ≤ Δf ≤ Δf_{max}	3.55MHz ≤ f_offset < f_offset_{max}	-13 dBm	100 kHz

Note for Tables 9.1, 9.2, 9.3, 9.4, 9.4A, 9.4B and 9.4C:

NOTE 1: This frequency range ensures that the range of values of f_offset is continuous.

NOTE 2 As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth can be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

9.1.3. Protection of the BS receiver in the operating band

This requirement shall be applied for the protection of UTRA FDD BS receiver in geographic areas in which UTRA-FDD Repeater and UTRA-FDD BS are deployed.

The requirement applies outside the emission mask.

9.1.3.1 Minimum Requirement

This requirement applies to the uplink of the repeater, at maximum gain.

The power of any operating band unwanted emission shall not exceed the limits in Table 9.7A.

Table 9.7A: Uplink operating band unwanted emissions limits for protection of the BS receiver

Maximum Level	Measurement Bandwidth	Note
-53 dBm	100 kHz	

NOTE 1: These requirements in Table 9.7A: for the uplink direction of the Repeater reflect what can be achieved with present state of the art technology and are based on a coupling loss of 73 dB between a Repeater and a UTRA FDD BS receiver.

NOTE 2: The requirements shall be reconsidered when the state of the art technology progresses.

NOTE 3: The protection of R-GSM is for further study.

9.1.4 Co-existence with services in adjacent frequency bands

This requirement may be applied for the protection in bands adjacent to bands I, II, III or VII, as defined in clause 5.1 in geographic areas in which both an adjacent band service and UTRA are deployed.

The requirement applies only to the down-link direction of the repeater.

9.1.4.1 Minimum requirement

The power of any spurious emission shall not exceed:

Table 9.16: UTRA Repeater down-link spurious emissions limits for protection of adjacent band services

Operating Band	Band	Maximum Level	Measurement Bandwidth	Note
I	2100-2105 MHz	-30 + 3.4 (f - 2100 MHz) dBm	1 MHz	
	2175-2180 MHz	-30 + 3.4 (2180 MHz - f) dBm	1 MHz	
II	1920-1925 MHz	-30 + 3.4 (f - 1920 MHz) dBm	1 MHz	
	1995-2000 MHz	-30 + 3.4 (2000 MHz - f) dBm	1 MHz	
III	1795-1800 MHz	-30 + 3.4 (f - 1795 MHz) dBm	1 MHz	
	1885-1890 MHz	-30 + 3.4 (1890 MHz - f) dBm	1 MHz	
VII	2610-2615 MHz	-30 + 3.4 (f - 2610 MHz) dBm	1 MHz	
	2695-2700 MHz	-30 + 3.4 (2700 MHz - f) dBm	1 MHz	

9.2 Spurious emissions

Spurious emissions are emissions which are caused by unwanted transmitter effects such as harmonics emission, parasitic emission, intermodulation products and frequency conversion products, but exclude out of band emissions. This is measured at the repeaters RF output port.

The spurious emission limits apply from 9 kHz to 12.75 GHz, excluding the frequency range from 10 MHz below the lowest frequency of the repeaters operating band up to 10 MHz above the highest frequency of the repeaters operating band. Exceptions are the requirement in Table 9.13 and 9.16 that apply also closer than 10 MHz from repeaters operating band.

Unless otherwise stated, all requirements are measured as mean power.

9.2.1 General Requirements

The requirements of either subclause 9.2.1.1 or subclause 9.2.1.2 shall apply whatever the type of repeater considered (one or several pass bands). It applies for all configurations foreseen by the manufacturer"s specification.

9.2.1.1 Minimum Requirement (Category A)

The following requirements shall be met in cases where Category A limits for spurious emissions, as defined in ITU-R Recommendation SM.329 [1], are applied.

At maximum repeater gain, with WCDMA signals in the pass band of the repeater, at levels that produce the maximum rated output power per channel, the power of any spurious emission shall not exceed the limits specified in table 9.5. The requirements shall also apply at maximum gain without WCDMA signals in the pass band.

When the power in all channels is increased by 10 dB, compared to the input level producing the maximum rated output power, the requirement shall still be met.

Table 9.5: Up-link and down-link: General spurious emissions limits, Category A

Band	Maximum level	Measurement Bandwidth	Note
9kHz - 150kHz	-13 dBm	1 kHz	Bandwidth as in ITU-R SM.329 [1], s4.1
150kHz - 30MHz		10 kHz	Bandwidth as in ITU-R SM.329 [1], s4.1
30MHz - 1GHz		100 kHz	Bandwidth as in ITU-R SM.329 [1], s4.1
1GHz - 12,75 GHz		1 MHz	Upper frequency as in ITU-R SM.329 [1], s2.5 table 1

9.2.1.2 Minimum Requirement (Category B)

The following requirements shall be met in cases where Category B limits for spurious emissions, as defined in ITU-R Recommendation SM.329 [1], are applied.

At maximum repeater gain, with WCDMA signals in the pass band of the repeater, at levels that produce the maximum rated power output per channel, the power of any spurious emission shall not exceed the limits specified in table 9.5A for the down- and up-link.

The requirements shall also apply at maximum gain without WCDMA signals in the pass band.

When the power in all channels is increased by 10 dB, compared to the input level producing the maximum rated output power, the requirement shall still be met.

Table 9.5A: General spurious emissions limits (Category B)

Band	Maximum Level	Measurement Bandwidth	Note
9 kHz ↔ 150 kHz	-36 dBm	1 kHz	Note 1
150 kHz ↔ 30 MHz	-36 dBm	10 kHz	Note 1
30 MHz ↔ 1 GHz	-36 dBm	100 kHz	Note 1
1 GHz ↔ 12.75 GHz	-30 dBm	1 MHz	Note 2
NOTE 1: Bandwidth as in ITU-R Recommendation SM.329 [1], s4.1 NOTE 2: Bandwidth as in ITU-R Recommendation SM.329 [1], s4.1. Upper frequency as in ITU-R SM.329 [1], s2.5 table 1			

Table 9.6: (Void)

Table 9.6A: (Void)

Table 9.6B: (Void)

Table 9.6C: (Void)

Table 9.6D: (Void)

Table 9.6E: (Void)

Table 9.6F: (Void)

9.2.2 Void

9.2.3 Co-existence with other systems in the same geographical area

These requirements may be applied for the protection of UE, MS and/or BS operating in other frequency bands in the same geographical area. The requirements may apply in geographic areas in which both UTRA FDD Repeater operating in frequency bands I to XIV and a system operating in another frequency band than the FDD operating band are deployed. The system operating in the other frequency band may be GSM900, DCS1800, PCS1900, GSM850 and/or FDD operating in bands I to XIV.

9.2.3.1 Minimum Requirements

The power of any spurious emission shall not exceed the limits of Table 9.9 for a UTRA FDD Repeater where requirements for co-existence with the system listed in the first column apply.

Table 9.9: UTRA Repeater up-link and down-link spurious emissions limits in geographic coverage area of systems operating in other frequency bands

System type operating in the same geographical area	Band for co-existence requirement	Maximum Level	Measurement Bandwidth	Note
GSM900	921 - 960 MHz	-57 dBm	100 kHz	This requirement does not apply to UTRA FDD Repeater operating in band VIII
	876 - 915 MHz	-61 dBm	100 kHz	This requirement does not apply to the up-link of the UTRA FDD Repeater operating in band VIII, since it is already covered by the band VIII requirement in sub-clause 9.1.3
DCS1800	1805 - 1880 MHz	-47 dBm	100 kHz	This requirement does not apply to UTRA FDD Repeater operating in band III.
	1710 - 1785 MHz	-61 dBm	100 kHz	This requirement does not apply to the up-link of the UTRA FDD Repeater operating in band III, since it is already covered by the band III requirement in sub-clause 9.1.3.
PCS1900	1930 - 1990 MHz	-47 dBm	100 kHz	This requirement does not apply to UTRA FDD Repeater operating in frequency band II.
	1850 - 1910 MHz	-61 dBm	100 kHz	This requirement does not apply to the up-link of the UTRA FDD Repeater operating in frequency band II, since it is already covered by the band II requirement in sub-clause 9.1.3.
GSM850	869 - 894 MHz	-57 dBm	100 kHz	This requirement does not apply to UTRA FDD Repeater operating in frequency band V.
	824 - 849 MHz	-61 dBm	100 kHz	This requirement does not apply to the up-link of the UTRA FDD Repeater operating in frequency band V, since it is already covered by the band V requirement in sub-clause 9.1.3.
FDD Band I	2110 - 2170 MHz	-52 dBm	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band I.
	1920 - 1980 MHz	-49 dBm	1 MHz	This requirement does not apply to the up-link of the UTRA FDD Repeater operating in band I, since it is already covered by the band I requirement in sub-clause 9.1.3.
FDD Band II	1930 - 1990 MHz	-52 dBm	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band II.
	1850 - 1910 MHz	-49 dBm	1 MHz	This requirement does not apply to the up-link of the UTRA FDD Repeater operating in band II, since it is already covered by the band II requirement in sub-clause 9.1.3.
FDD Band III	1805 - 1880 MHz	-52 dBm	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band III.
	1710 - 1785 MHz	-49 dBm	1 MHz	This requirement does not apply to the up-link of the UTRA FDD Repeater operating in band III, since it is already covered by the band III requirement in sub-clause 9.1.3.
FDD Band IV	2110 - 2155 MHz	-52 dBm	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band IV.
	1710 - 1755 MHz	-49 dBm	1 MHz	This requirement does not apply to the up-link of the UTRA FDD Repeater operating in band IV, since it is already covered by the band IV requirement in sub-clause 9.1.3.
FDD Band V	869 - 894 MHz	-52 dBm	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band V.

	824 - 849 MHz	-49 dBm	1 MHz	This requirement does not apply to the up-link of the UTRA FDD Repeater operating in band V, since it is already covered by the band V requirement in sub-clause 9.1.3.
FDD Band VI	860 - 895 MHz	-52 dBm	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band VI.
	815 - 850 MHz	-49 dBm	1 MHz	This requirement does not apply to the up-link of the UTRA FDD Repeater operating in band VI, since it is already covered by the band VI requirement in sub-clause 9.1.3.
FDD Band VII	2620 - 2690 MHz	-52 dBm	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band VII,
	2500 - 2570 MHz	-49 dBm	1 MHz	This requirement does not apply to the up-link of the UTRA FDD Repeater operating in band VII, since it is already covered by the band VII requirement in sub-clause 9.1.3.
FDD Band VIII	925 - 960 MHz	-52 dBm	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band VIII.
	880 - 915 MHz	-49 dBm	1 MHz	This requirement does not apply to the up-link of the UTRA FDD Repeater operating in band VIII, since it is already covered by the band VIII requirement in sub-clause 9.1.3.
FDD Band IX	1844.9 - 1879.9 MHz	-52 dBm	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band IX.
	1749. 9 - 1784.9 MHz	-49 dBm	1 MHz	This requirement does not apply to the up-link of the UTRA FDD Repeater operating in band IX, since it is already covered by the band IX requirement in sub-clause 9.1.3.
FDD Band X	2110 - 2170 MHz	-52 dBm	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band X.
	1710 - 1770 MHz	-49 dBm	1 MHz	This requirement does not apply to the up-link of the UTRA FDD Repeater operating in band X, since it is already covered by the band X requirement in sub-clause 9.1.3.
FDD Band XI	1475.9 - 1500.9 MHz	-52 dBm	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band XI.
	1427.9 - 1452.9 MHz	-49 dBm	1 MHz	This requirement does not apply to the up-link of the UTRA FDD Repeater operating in band X, since it is already covered by the band XI requirement in sub-clause 9.1.3.
FDD Band XII	728 - 746 MHz	-52 dBm	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band XII.
	698 - 716 MHz	-49 dBm	1 MHz	This requirement does not apply to the up-link of the UTRA FDD Repeater operating in band XII, since it is already covered by the band XII requirement in sub-clause 9.1.3.
FDD Band XIII	746 - 756 MHz	-52 dBm	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band XIII.
	777 - 787 MHz	-49 dBm	1 MHz	This requirement does not apply to the up-link of the UTRA FDD Repeater operating in band XIII, since it is already covered by the band XIII requirement in sub-clause 9.1.3.
FDD Band XIV	758 - 768 MHz	-52 dBm	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band XIV.
	788 - 798 MHz	-49 dBm	1 MHz	This requirement does not apply to the up-link of the UTRA FDD Repeater operating in band XIV, since it is already covered by the band XIV requirement in sub-clause 9.1.3.

9.2.4 Co-existence with co-located and co-sited Base Stations

These requirements may be applied for the protection of other BS receivers when GSM900 and/or DCS1800, PCS1900, GSM850 and/or FDD BS operating in Bands I to XIV are co-located with a UTRA FDD Repeater.

9.2.4.1 Minimum Requirements

The power of any spurious emission shall not exceed the limits of Table 9.10 for a UTRA FDD Repeater where requirements for co-location with the Base Station listed in the first column apply.

Table 9.10: UTRA Repeater up-link and down-link spurious emissions limits for Repeater co-located with Base Stations

Type of co-located Base Station	Band for co-location requirement	Maximum Level	Measurement Bandwidth	Note
GSM900	876 - 915 MHz	-98 dBm	100 kHz	This requirement does not apply to the up-link of UTRA FDD Repeater operating in band VIII. The requirement of band VIII in sub-clause 9.1.3 applies, but requires a 75dB coupling loss between base station and the repeater UL transmit port.
DCS1800	1710 - 1785 MHz	-98 dBm	100 kHz	This requirement does not apply to the up-link of UTRA FDD Repeater operating in band III. The requirement of band III in sub-clause 9.1.3 applies, but requires a 75dB coupling loss between base station and the repeater UL transmit port.
PCS1900	1850 - 1910 MHz	-98 dBm	100 kHz	This requirement does not apply to the up-link of UTRA FDD Repeater operating in band II. The requirement of band II in sub-clause 9.1.3 applies, but requires a 75dB coupling loss between base station and the repeater UL transmit port.
GSM850	824 - 849 MHz	-98 dBm	100 kHz	This requirement does not apply to the up-link of UTRA FDD Repeater operating in band V. The requirement of band V in sub-clause 9.1.3 applies, but requires a 75dB coupling loss between base station and the repeater UL transmit port.
UTRA FDD Band I	1920 - 1980 MHz	-96 dBm	100 kHz	This requirement does not apply to the up-link of UTRA FDD Repeater operating in band I. The requirement of band I in sub-clause 9.1.3 applies, but requires a 73dB coupling loss between base station and the repeater UL transmit port.
UTRA FDD Band II	1850 - 1910 MHz	-96 dBm	100 kHz	This requirement does not apply to the up-link of UTRA FDD Repeater operating in band II. The requirement of band II in sub-clause 9.1.3 applies, but requires a 73dB coupling loss between base station and the repeater UL transmit port.
UTRA FDD Band III	1710 - 1785 MHz	-96 dBm	100 kHz	This requirement does not apply to the up-link of UTRA FDD Repeater operating in band III. The requirement of band III in sub-clause 9.1.3 applies, but requires a 73dB coupling loss between base station and the repeater UL transmit port.
UTRA FDD Band IV	1710 - 1755 MHz	-96 dBm	100 kHz	This requirement does not apply to the up-link of UTRA FDD Repeater operating in band IV. The requirement of band IV in sub-clause 9.1.3 applies, but requires a 73dB coupling loss between base station and the repeater UL transmit port.
UTRA FDD Band V	824 - 849 MHz	-96 dBm	100 kHz	This requirement does not apply to the up-link of UTRA FDD Repeater operating in band V. The requirement of band V in sub-clause 9.1.3 applies, but requires a 73dB coupling loss between base station and the repeater UL transmit port.
UTRA FDD Band VI	815 - 850 MHz	-96 dBm	100 kHz	This requirement does not apply to the up-link of UTRA FDD Repeater operating in band VI. The requirement of band VI in sub-clause 9.1.3 applies, but requires a 73dB coupling loss between base station and the repeater UL transmit port.
UTRA FDD Band VII	2500 - 2570 MHz	-96 dBm	100 kHz	This requirement does not apply to the up-link of UTRA FDD Repeater operating in band VII. The requirement of band VII in sub-clause 9.1.3 applies, but requires a 73dB coupling loss between base station and the repeater UL transmit port.

UTRA FDD Band VIII	880 - 915 MHz	-96 dBm	100 kHz	This requirement does not apply to the up-link of UTRA FDD Repeater operating in band VIII. The requirement of band VIII in sub-clause 9.1.3 applies, but requires a 73dB coupling loss between base station and the repeater UL transmit port.
UTRA FDD Band IX	1749.9 - 1784.9 MHz	-96 dBm	100 kHz	This requirement does not apply to the up-link of UTRA FDD Repeater operating in band IX. The requirement of band IX in sub-clause 9.1.3 applies, but requires a 73dB coupling loss between base station and the repeater UL transmit port.
UTRA FDD Band X	1710 - 1770 MHz	-96 dBm	100 kHz	This requirement does not apply to the up-link of UTRA FDD Repeater operating in band X. The requirement of band X in sub-clause 9.1.3 applies, but requires a 73dB coupling loss between base station and the repeater UL transmit port.
UTRA FDD Band XI	1427.9 - 1452.9 MHz	-96 dBm	100 kHz	This requirement does not apply to the up-link of UTRA FDD Repeater operating in band XI. The requirement of band XI in sub-clause 9.1.3 applies, but requires a 73dB coupling loss between base station and the repeater UL transmit port.
UTRA FDD Band XII	698 - 716 MHz	-96 dBm	100 kHz	This requirement does not apply to the up-link of UTRA FDD Repeater operating in band XII. The requirement of band XII in sub-clause 9.1.3 applies, but requires a 73dB coupling loss between base station and the repeater UL transmit port.
UTRA FDD Band XIII	777 - 787 MHz	-96 dBm	100 kHz	This requirement does not apply to the up-link of UTRA FDD Repeater operating in band XIII. The requirement of band XIII in sub-clause 9.1.3 applies, but requires a 73dB coupling loss between base station and the repeater UL transmit port.
UTRA FDD Band XIV	788 - 798 MHz	-96 dBm	100 kHz	This requirement does not apply to the up-link of UTRA FDD Repeater operating in band XIV. The requirement of band XIV in sub-clause 9.1.3 applies, but requires a 73dB coupling loss between base station and the repeater UL transmit port.

9.2.5 Co-existence with PHS

This requirement may be applied for the protection of PHS in geographic areas in which both PHS and UTRA-FDD Repeaters are deployed. This requirement is also applicable at specified frequencies falling between 12,5 MHz below the centre frequency of the first 5 MHz channel or more than 12,5 MHz above the centre frequency of the last 5 MHz channel in the pass band.

9.2.5.1 Minimum Requirement

The power of any spurious emission shall not exceed:

Table 9.13: UTRA Repeater up-link and down-link spurious emissions limits for in geographic coverage area of PHS

Band	Maximum Level	Measurement Bandwidth	Note
1884,5 - 1919,6 MHz	-41 dBm	300 kHz	

9.2.6 Co-existence with UTRA-TDD

9.2.6.1 Operation in the same geographic area

This requirement may be applied to geographic areas in which both UTRA-TDD and UTRA-FDD Repeaters are deployed.

9.2.6.1.1 Minimum Requirement

In the down-link direction of the Repeater the power of any spurious emission shall not exceed:

Table 9.14: UTRA Repeater down-link spurious emissions limits in geographic coverage area of UTRA-TDD

Band	Maximum Level	Measurement Bandwidth	Note
1900 - 1920 MHz	-52 dBm	1 MHz	
2010 - 2025 MHz	-52 dBm	1 MHz	
2570 - 2610 MHz	-52 dBm	1 MHz	

In the up-link direction of the Repeater the power of any spurious emission shall not exceed:

Table 9.14A: UTRA Repeater up-link spurious emissions limits in geographic coverage area of UTRA-TDD

Band	Maximum Level	Measurement Bandwidth	Note
1900 - 1920 MHz	-53 dBm	100 kHz	This requirement is applied only to UTRA FDD Repeater operating in band I or II.
1900 - 1920 MHz	-52 dBm	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band I or II.
2010 - 2025 MHz	-52 dBm	1 MHz	
2570 - 2610 MHz	-53 dBm	100 kHz	This requirement is applied only to UTRA FDD Repeater operating in band VII.
2570 - 2610 MHz	-52 dBm	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band VII.

NOTE 1: The requirements of -53dBm/100kHz in Table 9.14A for the up link direction of the Repeater reflect what can be achieved with present state of the art technology and are based on a coupling loss of 73 dB between a Repeater and a UTRA TDD BS receiver.

NOTE 2: The requirements shall be reconsidered when the state of the art technology progresses.

9.2.6.2 Co-located Repeaters and UTRA-TDD base stations

This requirement may be applied for the protection of UTRA-TDD BS receivers when UTRA-TDD BS and UTRA-FDD Repeater are co-located.

9.2.6.2.1 Minimum Requirement

In the down-link direction of the Repeater the power of any spurious emission shall not exceed:

Table 9.15: UTRA Repeater down-link spurious emissions limits for protection of co-located UTRA TDD BS receiver

Band	Maximum Level	Measurement Bandwidth	Note
1900 - 1920 MHz	-86 dBm	1 MHz	
2010 - 2025 MHz	-86 dBm	1 MHz	
2570 - 2610 MHz	-86 dBm	1 MHz	

In the up-link direction of the Repeater the power of any spurious emission shall not exceed:

Table 9.15A: UTRA Repeater up-link spurious emissions limits for protection of co-located UTRA TDD BS receiver

Band	Maximum Level	Measurement Bandwidth	Note
1900 - 1920 MHz	-53 dBm	100 kHz	This requirement is applied only to UTRA FDD Repeater operating in band I or II.
1900 - 1920 MHz	-86 dBm	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band I or II.
2010 - 2025 MHz	-83 dBm	100 kHz	This requirement is applied only to UTRA FDD Repeater operating in band I.
2010 - 2025 MHz	-86 dBm	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band I
2570 - 2610 MHz	-53 dBm	100 kHz	This requirement is applied only to UTRA FDD Repeater operating in band VII.
2570 - 2610 MHz	-86 dBm	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band VII.

NOTE 1: The requirements of -53dBm/100kHz in Table 9.15A for the up link direction of the Repeater reflect what can be achieved with present state of the art technology and are based on a coupling loss of 73 dB between a Repeater and a UTRA TDD BS receiver.

NOTE 2: The requirements of -83dBm/100kHz in Table 9.15A for the up link direction of the Repeater reflect what can be achieved with present state of the art technology and are based on a coupling loss of 43 dB between a Repeater and a UTRA TDD BS receiver.

NOTE 3: The requirements shall be reconsidered when the state of the art technology progresses.

9.2.7 Void

9.2.8 Protection of public safety operations

This requirement shall be applied to Repeater operating in Bands XIII and XIV to ensure that appropriate interference protection is provided to 700 MHz public safety operations. This requirement is also applicable at specified frequencies falling between 12.5 MHz below the first carrier frequency used and 12.5 MHz above the last carrier frequency used.

9.2.8.1 Minimum Requirement

The power of any spurious emission shall not exceed:

Table 9.16: Spurious emissions limits for the up-link and down-link of UTRA Repeater for protection of public safety operations

Operating Band	Band	Maximum Level	Measurement Bandwidth	Note
XIII	763 - 775 MHz	-46 dBm	6.25 kHz	
XIII	793 - 805 MHz	-46 dBm	6.25 kHz	
XIV	769 - 775 MHz	-46 dBm	6.25 kHz	
XIV	799 - 805 MHz	-46 dBm	6.25 kHz	

10 Modulation accuracy

10.1 Error Vector Magnitude

The modulation accuracy is defined by the Error Vector Magnitude (EVM), which is a measure of the difference between the theoretical waveform and a modified version of the measured waveform. This difference is called the error vector. The measured waveform is modified by first passing it through a matched root raised cosine filter with bandwidth 3.84 MHz and roll-off α=0.22. The waveform is then further modified by selecting the frequency, absolute phase, absolute amplitude and chip clock timing so as to minimise the error vector. The EVM result is defined as root of the ratio of the mean error vector power to the mean reference signal power expressed as a %.

The measurement interval is one power control group (timeslot). The repeater shall operate with an ideal WCDMA signal in the pass band of the repeater at a level, which produce the maximum rated output power per channel, as specified by the manufacturer.

10.1.1 Minimum requirement

The Error Vector Magnitude shall not be worse than 12,5 %.

10.2 Peak code domain error

The peak code domain error is computed by projecting the power of the error vector (as defined in subclause 10.1) onto the code domain at a specified spreading factor. The code domain error for every code in the domain is defined as the ratio of the mean power of the projection onto that code, to the mean power of the composite reference waveform. This ratio is expressed in dB. The peak code domain error is defined as the maximum value for the code domain error for all codes. The measurement interval is one power control group (timeslot).

10.2.1 Minimum requirement

The peak code domain error shall not exceed -35 dB at spreading factor 256.

11 Input Intermodulation

The input intermodulation is a measure of the capability of the repeater to inhibit the generation of interference in the pass band, in the presence of interfering signals on frequencies other than the pass band.

11.1 General Requirement

The following requirement applies for interfering signals in the frequency bands defined in sub-clause 5.1, depending on the repeaters pass band. The requirement shall bet met with the repeater operating at maximum gain.

11.1.1 Minimum requirement

For the parameters specified in table 11.1, the power in the pass band, shall not increase with more than 10 dB at the output of the repeater as measured in the centre of the pass band, compared to the level obtained without interfering signals applied.

The frequency separation between the two interfering signals shall be adjusted so that the 3rd order intermodulation product is positioned in the centre of the pass band.

Table 11.1 specifies the parameters for two interfering signals, where:

- f_offset is the separation between the centre frequency of first or last 5 MHz channel in the pass band and one the interfering signals.

Table 11.1: Input intermodulation requirement

f_offset	Interfering Signal Levels	Type of signals	Measurement bandwidth
3,5 MHz	-40 dBm	2 CW carriers	1 MHz

11.2 Co-location with BS in other systems

The requirement shall bet met with the repeater operating at maximum gain.

11.2.1 Minimum requirements - Co-location with GSM900, DCS 1800, PCS1900, GSM850 and/or UTRA FDD

This additional input intermodulation requirement may be applied for the protection of FDD Repeater input when GSM900, DCS1800, PCS1900, GSM850 and/or FDD BS operating in Bands I to XIV are co-located with a UTRA FDD Repeater.

For the parameters specified in table 11.2, the power in the pass band shall not increase with more than 10 dB at the output of the repeater as measured in the centre of the pass band, compared to the level obtained without interfering signals applied.

The frequency separation between the two interfering signals shall be adjusted so that the lowest order intermodulation product is positioned in the centre of the pass band.

NOTE 1: The lowest intermodulation products corresponds to the 4th and 3rd order for the GSM 900 and DCS 1800 bands, respectively.

Table 11.2: Input intermodulation requirements for interfering signals in other systems

Co-located other systems	Frequency of interfering signals	Interfering Signal Levels	Type of signals	Measurement bandwidth	Note
GSM900	921 - 960 MHz	+16 dBm	2 CW carriers	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band VIII, since it is already covered by the requirement in sub-clause 11.1, but requires a 86dB coupling loss between base station and the repeater DL receive port.
DCS1800	1805 - 1880 MHz	+16 dBm	2 CW carriers	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band III, since it is already covered by the requirement in sub-clause 11.1, but requires a 86dB coupling loss between base station and the repeater DL receive port.
PCS1900	1930 - 1990 MHz	+16 dBm	2 CW carriers	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band II, since it is already covered by the requirement in sub-clause 11.1, but requires a 86dB coupling loss between base station and the repeater DL receive port.
GSM850	869 - 894 MHz	+16 dBm	2 CW carriers	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band V, since it is already covered by the requirement in sub-clause 11.1, but requires a 86dB coupling loss between base station and the repeater DL receive port.
UTRA-FDD Band I	2110 - 2170 MHz	+16 dBm	2 CW carriers	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band I, since it is already covered by the requirement in sub-clause 11.1, but requires a 86dB coupling loss between base station and the repeater DL receive port.
UTRA-FDD Band II	1930 - 1990 MHz	+16 dBm	2 CW carriers	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band II, since it is already covered by the requirement in sub-clause 11.1, but requires a 86dB coupling loss between base station and the repeater DL receive port.
UTRA-FDD Band III	1805 - 1880 MHz	+16 dBm	2 CW carriers	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band III, since it is already covered by the requirement in sub-clause 11.1, but requires a 86dB coupling loss between base station and the repeater DL receive port.
UTRA-FDD Band IV	2110 - 2155 MHz	+16 dBm	2 CW carriers	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band IV, since it is already covered by the requirement in sub-clause 11.1, but requires a 86dB coupling loss between base station and the repeater DL receive port.
UTRA-FDD Band V	869 - 894 MHz	+16 dBm	2 CW carriers	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band V, since it is already covered by the requirement in sub-clause 11.1, but requires a 86dB coupling loss between base station and the repeater DL receive port.
UTRA-FDD Band VI	875 - 885 MHz	+16 dBm	2 CW carriers	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band VI, since it is already covered by the requirement in sub-clause 11.1, but requires a 86dB coupling loss between base station and the repeater DL receive port.
UTRA-FDD Band VII	2620 - 2690 MHz	+16 dBm	2 CW carriers	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band VII, since it is already covered by the requirement in

					sub-clause 11.1, but requires a 86dB coupling loss between base station and the repeater DL receive port.
UTRA-FDD Band VIII	925 - 960 MHz	+16 dBm	2 CW carriers	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band VIII, since it is already covered by the requirement in sub-clause 11.1, but requires a 86dB coupling loss between base station and the repeater DL receive port.
UTRA-FDD Band IX	1844.9 - 1879.9 MHz	+16 dBm	2 CW carriers	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band IX, since it is already covered by the requirement in sub-clause 11.1, but requires a 86dB coupling loss between base station and the repeater DL receive port.
UTRA-FDD Band X	2110 - 2170 MHz	+16 dBm	2 CW carriers	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band X, since it is already covered by the requirement in sub-clause 11.1, but requires a 86dB coupling loss between base station and the repeater DL receive port.
UTRA-FDD Band XI	1475.9 - 1500.9 MHz	+16 dBm	2 CW carriers	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band XI, since it is already covered by the requirement in sub-clause 11.1, but requires a 86dB coupling loss between base station and the repeater DL receive port.
UTRA-FDD Band XII	728 - 746 MHz	+16 dBm	2 CW carriers	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band XII, since it is already covered by the requirement in sub-clause 11.1, but requires a 86dB coupling loss between base station and the repeater DL receive port.
UTRA-FDD Band XIII	746 - 756 MHz	+16 dBm	2 CW carriers	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band XIII, since it is already covered by the requirement in sub-clause 11.1, but requires a 86dB coupling loss between base station and the repeater DL receive port.
UTRA-FDD Band XIV	758 - 768 MHz	+16 dBm	2 CW carriers	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band XIV, since it is already covered by the requirement in sub-clause 11.1, but requires a 86dB coupling loss between base station and the repeater DL receive port.

11.2.2 Minimum Requirement - Co-location with UTRA-TDD

An additional input intermodulation requirement may be applied for the protection of FDD BS receivers when UTRA TDD is co-located with a UTRA FDD Repeater.

The requirements in this chapter assume a 30 dB coupling loss between transmitter and receiver.

The current state-of-the-art technology does not allow a single generic solution for co-location with UTRA-TDD on adjacent frequencies for 30dB BS-Repeater minimum coupling loss.

However, there are certain site-engineering solutions that can be used. These techniques are addressed in TR 25.942 [5].

Table 11.2A: Input intermodulation requirements for interfering signals in UTRA TDD systems

Co-located other system	Frequency of interfering signals	Interfering Signal Levels	Type of signals	Measurement bandwidth
UTRA-TDD	2585 - 2620 MHz	+16 dBm	2 CW carriers	1 MHz

11.3 Co-existence with other systems

The following requirement may be applied when GSM 900, DCS 1800, PCS1900, GSM850 and/or UTRA FDD BS operating in another frequency band and UTRA-FDD Repeaters co-exist. The requirement shall bet met with the repeater operating at maximum gain.

11.3.1 Minimum requirements

For the parameters specified in table 11.3, the power in the pass band shall not increase with more than 10 dB at the output of the repeater as measured in the centre of the pass band, compared to the level obtained without interfering signals applied.

The frequency separation between the two interfering signals shall be adjusted so that the lowest order intermodulation product is positioned in the centre of the pass band.

NOTE 1: The lowest intermodulation products corresponds to the 4^{th} and 3^{rd} order for the GSM 900 and DCS 1800 bands, respectively.

Table 11.3: Input intermodulation requirements for interfering signals in other systems

Co-existence with other systems	Frequency of interfering signals	Interfering Signal Levels	Type of signals	Measurement bandwidth	Note
GSM900	876 - 915 MHz	-15 dBm	2 CW carriers	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band VIII, since it is already covered by the requirement in sub-clause 11.1.
DCS1800	1710 - 1785 MHz	-15 dBm	2 CW carriers	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band III, since it is already covered by the requirement in sub-clause 11.1.
PCS1900	1850 - 1910 MHz	-15 dBm	2 CW carriers	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band II, since it is already covered by the requirement in sub-clause 11.1.
GSM850	824 - 849 MHz	-15 dBm	2 CW carriers	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band V, since it is already covered by the requirement in sub-clause 11.1.
UTRA-FDD Band I	1920 - 1980 MHz	-15 dBm	2 CW carriers	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band I, since it is already covered by the requirement in sub-clause 11.1.
UTRA-FDD Band II	1850 - 1910 MHz	-15 dBm	2 CW carriers	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band II, since it is already covered by the requirement in sub-clause 11.1.
UTRA-FDD Band III	1710 - 1785 MHz	-15 dBm	2 CW carriers	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band III, since it is already covered by the requirement in sub-clause 11.1.
UTRA-FDD Band IV	1710 - 1755 MHz	-15 dBm	2 CW carriers	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band IV, since it is already covered by the requirement in sub-clause 11.1.
UTRA-FDD Band V	824 - 849 MHz	-15 dBm	2 CW carriers	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band V, since it is already covered by the requirement in sub-clause 11.1.
UTRA-FDD Band VI	830 - 840 MHz	-15 dBm	2 CW carriers	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band VI, since it is already covered by the requirement in sub-clause 11.1.
UTRA-FDD Band VII	2500 - 2570 MHz	-15 dBm	2 CW carriers	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band VII, since it is already covered by the requirement in sub-clause 11.1.
UTRA-FDD Band VIII	880 - 915 MHz	-15 dBm	2 CW carriers	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band VIII, since it is already covered by the requirement in sub-clause 11.1.
UTRA-FDD Band IX	1749,9 - 1784,9 MHz	-15 dBm	2 CW carriers	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band IX, since it is already covered by the requirement in sub-clause 11.1.
UTRA-FDD Band X	1710 - 1770 MHz	-15 dBm	2 CW carriers	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band X, since it is already covered by the requirement in sub-clause 11.1.
UTRA-FDD Band XI	1427.9 - 1452.9 MHz	-15 dBm	2 CW carriers	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band XI, since it is already covered by the requirement in sub-clause 11.1.

UTRA-FDD Band XII	698 - 716 MHz	-15 dBm	2 CW carriers	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band XII, since it is already covered by the requirement in sub-clause 11.1.
UTRA-FDD Band XIII	777 - 787 MHz	-15 dBm	2 CW carriers	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band XIII, since it is already covered by the requirement in sub-clause 11.1.
UTRA-FDD Band XIV	788 - 798 MHz	-15 dBm	2 CW carriers	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band XIV, since it is already covered by the requirement in sub-clause 11.1.

12 Output intermodulation

The output intermodulation requirement is a measure of the ability of the repeater to inhibit the generation of intermodulation products signals created by the presence of an interfering signal reaching the repeater via the output port.

The output intermodulation level is the power of the intermodulation products when a WCDMA modulated interference signal is injected into the output port at a level of 30 dB lower than that of the wanted signal. The frequency of the interference signal shall be ±5 MHz, ±10 MHz and ±15 MHz offset from the wanted signal, but within the frequency band allocated for UTRA FDD downlink as specified in subclause 4.1.

The requirement is applicable for downlink signals.

12.1 Minimum requirement

The output intermodulation level shall not exceed the out of band emission or the spurious emission requirements of section 9.1 and 9.2.

13 Adjacent Channel Rejection Ratio (ACRR)

13.1 Definitions and applicability

Adjacent Channel Rejection Ratio (ACRR) is the ratio of the RRC weighted gain per carrier of the repeater in the pass band to the RRC weighted gain of the repeater on an adjacent channel.

The requirement shall apply to the Uplink and Downlink of Repeater where the donor link is maintained via antennas (over the air Repeater).

13.2 Minimum Requirements

In normal conditions the ACRR shall be higher than the value specified in the Table 13.1.

Table 13.1: Repeater ACRR

Repeater maximum output power as in 9.1.1	Channel offset from the centre frequency of the first or last 5 MHz channel within the pass band.	ACRR limit
P ≥ 31 dBm	5 MHz	33dB
P ≥ 31 dBm	10 MHz	33dB
P < 31 dBm	5 MHz	20dB
P < 31 dBm	10 MHz	20dB

Annex A (informative): Change History

TSG	Doc	CR	R	Title	Cat	Curr	New	Work Item
RP-31				Rel-7 version created; based on v6.4.0			7.0.0	
RP-31	RP-060100	0042	2	Introduction of operating band III to IX requirements in 25.106	B	6.3.0	7.0.0	TEI7
RP-31	RP-060110	0043		Correction of spurious emissions for coexistence with GSM900 in same geographic area	F	6.3.0	7.0.0	RInImp-UMTS900
RP-33	RP-060520	0046	1	Clean up of Spurious emissions	A	7.0.0	7.1.0	TEI5
RP-33	RP-060521	0049	1	New UTRA Repeater up-link spurious emissions limits for co-existence/co-location with TDD	A	7.0.0	7.1.0	TEI5
RP-34	RP-060811	0052	1	Corrections to input intermodulation	A	7.1.0	7.2.0	TEI5
RP-36	RP-070370	0056		Category B spurious emission limits for UTRA Repeater	A	7.2.0	7.3.0	TEI4
RP-36	RP-070373	0057		Introduction of operating band X into the repeater specification	B	7.2.0	7.3.0	TEI7
RP-39	RP-080126	0058		Introduction of UMTS1500 requirements	B	7.3.0	8.0.0	RInImp8-UMTS1500
				Minor correction to CR implementation		8.0.0	8.0.1	
				Update of history table		8.0.1	8.0.2	
RP-42	RP-080943	60	1	Introduction of operating band unwanted emission	F	8.0.2	8.1.0	TEI8
RP-45	RP-080819	61		Introduction of band XII, XIII, XIV	F	8.1.0	8.2.0	TEI8
RP-45	RP-080819	62		CR to limit the scope to FDD only to 25.106	F	8.1.0	8.2.0	TEI8

History

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